

A hundred years of the Gardens' Bulletin, Singapore

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ABSTRACT. Historical developments are traced pertaining to the founding and transformation of the *Agricultural Bulletin of the Malay Peninsula*, 1891–1900, the *Agricultural Bulletin of the Straits and Federated Malay States*, 1901–1911, the first two periodicals of the Singapore Botanic Gardens, and the *Agricultural Bulletin of the Straits and Federated Malay States, Third Series*, which began in 1912. This third series soon continued as the *Gardens' Bulletin, Straits Settlements* when in 1913 it was decided to continue the journal from the Botanic Gardens with a name change to avoid confusion with an *Agricultural Bulletin* separately begun for the Federated Malay States, as their new Department of Agriculture developed and economic activities around agriculture intensified. After World War II, this continued as the *Gardens' Bulletin, Singapore*, which achieved its centenary in 2012. The early focus on the *Hevea* rubber crop and industry during the time of H.N. Ridley, its founding editor, and the re-orientation of the *Gardens' Bulletin* into a journal with increased original content in the botanical (especially taxonomic) sciences from the period of I.H. Burkill, Ridley's successor, are described. Historical events, especially the administrative divergence between the Straits Settlements and the Federated Malay States, the impact of World War II and post-war political development, the development of administrative organisation within the newly independent Singapore; and the integration of botanical science over the Malesian botanical region wherein the Malay Peninsula is located, have contributed to shaping the focus and scope of the *Bulletin*. The development phases of the Singapore Botanic Gardens—home of the *Bulletin*—as well as the pivotal roles of its leading botanists, are examined, through stages of scientific transformation from an essentially “Malayan” perspective largely maintained by a small botanical home team, to a more regionally relevant research programme, and finally an international outlook that continues to sustain its Southeast Asian emphasis.

Keywords. *Agricultural Bulletin*, botanical journal, Federated Malay States, Flora Malesiana, Gardens' Bulletin, *Hevea* rubber, Malaya, Malay Peninsula, Malesia, plant taxonomy, Ridley, Singapore Botanic Gardens, Straits Settlements

A centenary measures not just antiquity, but also continuity, progress and outlook. Its arrival makes us take stock of developments and the many phases that would have naturally accrued. Even though centenaries are now much more commonly observed than previously, still each arriving occasion never fails to be evocative, for a hundred years of history yield a great many interactions and events that would have touched very many aspects of life and society. This year, 2012, the *Gardens' Bulletin, Singapore* turns a hundred years old.

Scientific publishing at the Singapore Botanic Gardens began when the organisation was part of a larger entity called the Gardens and Forest Department,

Straits Settlements. The Straits Settlements were a British Crown Colony made up of Malacca, Penang, Province Wellesley, Singapore, and Pangkor and the Sembilan Islands off the Perak (mid-western) coastline of the Malay Peninsula. The Gardens and Forest Department was created in 1883 under the Superintendent of Gardens, Straits Settlements, a position occupied by Nathaniel Cantley from 1880 to 1888. Although the Singapore Botanic Gardens had been inceptioned in 1859 at its present site in Tanglin by the Singapore Agri-Horticultural Society, its maintenance was passed onto the Straits Settlements Government in late 1874, and by 1878 the legislation was approved for the Gardens to be officially managed by the colonial government (Burkill 1918a, b). Its main role then was to serve agricultural and economic development for its territories as well as the rest of Malaya (Burkill 1983), a geographical designation that referred to the main part of the Malay Peninsula (including Singapore) which came under British influence. Cantley was only the second full-time horticultural superintendent recruited from the Royal Botanic Gardens, Kew, following James Murton (1875–1880).

Prelude as an agricultural bulletin

In 1888, Henry Nicholas Ridley became the first Director of the Singapore Botanic Gardens and was intricately linked to the development of the Gardens' periodicals that followed. In fact, two other series preceded the present *Bulletin*. The first was called the *Agricultural Bulletin of the Malay Peninsula*, with No. 1 (pages 1–17) issued in April 1891 and No. 9 (pages 239–289), the last, issued in May 1900. The front page for each of the first five issues (up to May 1896) declared its prospectus:

It is proposed to publish from time to time, as occasion may serve, Bulletins on subjects connected with Agriculture and Horticulture in the Malay Peninsula. It is hoped that planters will send to the Director of the Botanic Gardens, Singapore, notes and observations on the cultivations of the various crops under their care. Observations on insect and fungus-pests are specially requested, and these should always be accompanied by specimens of the injurious insect or fungi either alive, or preserved in spirits, except in the case of butterflies and moths which should be sent dry in envelopes.

Although most of the issues carried brief articles, the coverage included diseases of coffee, nutmeg and clove trees, pests and injurious fungi. There were interesting essays on crops of potentially wider cultivation, such as gambir, patchouli, sago, sugar cane, lemon grass oil, citronella oil, fibre plants, dye plants, spices, vegetables, and, of course, Para rubber. Ridley edited and wrote most of the material and was himself only occasionally credited at the end of an article from issue No. 5 (1896) onwards, with Charles Curtis (Assistant Superintendent of Gardens and Forests in Penang, 1884–1903) contributing two articles on the cultivation of pot plants and sugar cane plants developing from seed, and A.L. Butler (of the Selangor Museum), an account of an extensive bee-hawk moth caterpillar attack on a coffee plantation. The brevity of the issues was not surprising, as Ridley's time was also taken up for developing the Gardens, organising an improved herbarium and specimen exchange with, and contributions from, Kew, Calcutta, the British Museum and collectors of the Malayan

flora in general, besides himself conducting an active field survey and collecting programme into Malayan forests and starting many horticultural investigations.

The issuance of an agricultural bulletin made sense with the emphasis given to economic botany. The purview of the Singapore Botanic Gardens was not only to assist in introducing crops of economic benefit and making studies for enhancing their cultivation, but also to help explore and document what was then a very poorly known flora of Malaya. As it would turn out, Ridley's well-documented accomplishments were as incredible in consequence as they were wide in scope. He not only pioneered the cultivation and excision tapping techniques that helped to encourage the planting of *Hevea* as an economic crop (Fig. 1) (Wycherley 1959, Brockway 2000), but was probably the best known explorer and scribe of the Malayan flora (Ridley 1922–1925).

A distinct Department of Forests, Straits Settlements (S.S.) and Federated Malay States (F.M.S.), headquartered in Kuala Lumpur, was set up in 1901 after the urging of both Ridley and H.C. Hill (1900a, b) of the Indian Forest Service, the latter commissioned to report on forest administration in these territories. (The F.M.S. were formed by the states of Perak, Selangor, Negri Sembilan and Pahang, each of which had a British Resident.) Responsibility for forest administration was thus separated from the Gardens' function, with Alfred M. Burn-Murdoch transferred from the Burma Forest Service to be Chief Forest Officer of the S.S. and F.M.S. in 1901, this post becoming the Conservator of Forests from 1904 (Wong 1987). The Singapore Botanic Gardens continued to be the centre for disseminating information on agriculture (Burkill 1983), so the beginning of a new and more focussed bulletin was commensurate with this role. This second series of the bulletin was the *Agricultural Bulletin of the Straits and Federated Malay States*, with Vol. 1, No. 1 issued in October 1901 and carrying an introduction by Walter Fox, Acting Director of the Singapore Botanic Gardens when Ridley was away on leave:

...having regard to the large and increasing number of Agriculturists and others taking an interest in Agriculture, the time has now come when something more than the Bulletin mentioned above is required... It is now proposed to publish a monthly Bulletin, which shall incorporate the old one, and as far as possible enlarge its scope by making it the medium for the exchange and record of Planters' experiences in all that pertains to their interests ...in a word make it a Planters' Paper for Planters.

The march of the bulletins

Ridley continued to serve as editor. The monthly issues in this second series carried a few longer articles but had a good measure of attention given to potential, experimental or emerging crops, and commodity prices in London and Singapore. The products listed reflected market interest then and included cocaine, then used as a local anaesthetic and becoming more commonly known as a performance enhancer (Karch 1998). Mention on page 35 in No. 1 of Vol. 1 (October 1901) stated: "The exports of crude cocaine from Peru during 1900 amounted to 16,479 lbs., valued at \$563,625. Of this quantity the United States received 1,016 lbs. direct." Ridley's article on *Timbers*



Fig. 1. Henry Ridley (left) with a rubber-tapping experiment. From *Gardens' Bulletin, Straits Settlements* 1(8), facing p. 263.

of the Malay Peninsula anchored the inaugural number and subsequent instalments up to its conclusion in No. 8 (May 1902). His other contribution made in instalments was *Fruits of the Malay Peninsula, Wild or Cultivated* (Vol. 1 No. 10: 371–381, printed as July 1902 but hand-corrected to August), which continued into Nos. 11, 12 and 13. Shorter articles included such as *The World's Tea and Coffee Consumption* (No. 3: 115–117), *Notes on Gutta Percha Trees* by Charles Curtis (No. 6: 220–223), *A New Instrument for Tapping Rubber Trees* (No. 6: 230–231), *New Rubber in Saigon* (No. 7: 274), *Rubber vines in French Indo-China* (No. 9: 333–335) and *The Cultivation of Orchids for Amateurs* by Curtis (No. 14: 586–588). When authorship was not indicated, these were usually abstracts from other reports, notices or short notes; a number by Ridley himself were indicated with the initials “H.N.R.” at the end, such as his essay on *Volatile Oils* (No. 9: 335–342). The topics represented a healthy interest in all things possible to grow or transact in a tropical environment, and centred on commercial hevea and other types of rubber (with Gutta Rambong or *Ficus elastica*, the India Rubber, already mentioned in No. 5 as an interesting potential source of commercial rubber being tried in Malacca, and which later brought Ridley there to view trials set up by local businessman Tan Chay Yan).

The lack of a very large diversity of contributing authors probably led to E.B. Skinner's *The United Planters' Association, F.M.S. Report for 1901* (published in the *Bulletin* No. 10: 393–400) stating that the *Agricultural Bulletin* should benefit from an identified “band of contributors” that included Charles Curtis (Superintendent of Gardens & Forests, Penang & Province Wellesley), Robert Derry (then Assistant Superintendent of Forests, partly in Malacca, partly in Perak; subsequently also a Curator at the Botanic Gardens in Singapore), Leonard Wray (Curator of the Perak State Museum), Stanley Arden (an official of the Agricultural Department in Selangor), the Chief Forest Officer (Colony & F.M.S.) and E.V. Carey (Chairman of the Planters' Association). Aside from mentioning complaints on typographical errors, the report also recorded that the Governments of Colony and the F.M.S. “each promised a grant of \$300 per annum towards the expenses of publishing the *Bulletin*.”

Timeliness of the issues in this second series was generally well observed. As Vol. 1 began in October 1901, it went into No. 14 in December 1902; thereafter, from Vol. 2 onwards, each volume began with No. 1 in January and ended with No. 12 in December of a calendar year. In all, ten volumes were published, ending with Vol. 10, No. 12 in December 1911. Ridley was the editor in the main, although Volumes 5–7 were credited as being edited by H.N. Ridley (Director of Botanic Gardens, S.S.) and J.B. Carruthers (Director of Agriculture & Government Botanist, F.M.S.). Nonetheless, the editorial in Vol. 5 No. 1 (January 1906) still used the singular form:

The Editor would always be glad to receive correspondence or notes on Agricultural or Horticultural subjects...He would call the attention of planters and others to the fact that when the *Bulletin* was started in its present form, many were the promises of support in these matters. During the past year hardly a note has been sent for the *Bulletin*...

Following this lament, most of the writing was still Ridley's. Carruthers left the F.M.S. for a position in Trinidad in March 1909, returning the editorship solely to Ridley.

This *Bulletin* series recorded many notable snippets of information, such as

Ridley's *Malay Drugs* (Vol. 5 No. 6: 193–206, No. 7: 245–254, No. 8: 269–282) and others like *Fall of Hail in Ulu Laugat*, *Pandan Hats*, *Note on the Method of Preparing Dragon's Blood*, *A Nest of *Termes malayanus* with many Queens*, etc. He had many agriculturally inclined articles too, among which were: *Pine-Apples* (Vol. 3: 1–6) and *Pineapple Cultivation* (Vol. 3: 37–40), the latter heralding an increasing interest in the crop that was eventually, in the 1970s and 1980s, to become a significant feature of the Johor agricultural landscape in south Peninsular Malaysia, before giving way to oil palm. As for the beginnings of commercial interest in oil palm, Ridley (1908: 4) noted that “There was a demand for seeds of the Oil Palm (*Elaeis guineensis*) due to an article in the ‘Agricultural Bulletin’ of this year [1907]” pointing out the value of this plant in cultivation. Articles such as *A remarkably prolific coconut* (Vol. 8 No. 7, July 1909) (Fig. 2) provided incomparable interest in the unusual, yet possible, obtainment of extreme productivity, of incredible attraction to the agriculturist's essentially insatiable expectations.

And Ridley did entertain all manner of agricultural correspondence, including offering advice on ridding soil of rhinoceros beetle larvae (Vol. 3 No. 1: 18–19). The Director's interest in his Gardens was not forgotten, and there were also articles of practical value there, such as *The Palm Collection of the Botanic Gardens, Singapore* (Vol. 3 No. 7: 249–266), which recorded 236 species in 90 genera, probably the finest in Malaya. Later (March 1910), there was occasion for disappointment, when Ridley reported *The Abolition of the Botanic Gardens of Penang* (Vol. 9 No. 3: 97–105): plans were afoot to convert the Gardens in Penang into a reservoir, which, however, did not materialise.

Undeniably, there was an overwhelming interest in rubber in the *Agricultural Bulletin* of that time. In May 1906 (Vol. 5 No. 5), *The United Planters' Association Report for 1905* declared for rubber thus—“The triumphant progress of this part of our Agricultural Industry has continued unslacked. The fame of the F.M.S. as a rubber producing country is spreading far and wide...” Many articles appeared that were concerned with the properties, cultivation and tapping of rubber, industrial processing and attendant machinery, and trade in the commodity. For the 2nd International Exhibition of Rubber and Allied Trades 1911 in London (24 June to 11 July, 1911), a major event, it was noted that “Mr Ridley promised to be responsible for the supply of stumps to show the methods of tapping” and “...to write a pamphlet dealing with the history of rubber in Malaya” (Vol. 10 No. 1: 11–12). In March 1911 (Vol. 10 No. 3), Ridley even describes the operation of his trial Rubber Smoking House: “...I will first describe the smoking house in the Botanic Gardens, which has proved quite satisfactory and economical. The building is 55½ feet long and 19 feet wide, oblong in shape, and made of ordinary planking with a high roof...”

So Mr Ridley was evidently kept rather busy. He was also editor of the *Journal of the Royal Asiatic Society, Straits Branch*, from 1889 to 1911, as well as secretary of the Society, and published many taxonomic papers in that journal as the *Agricultural Bulletin* was so devoted to economic botany. The *Agricultural Bulletin* included a lighter side with snippets that must have involved some straight-faced moments, such as with *The Mosquito Plant*, *Ocimum viride* (Vol. 3 No. 1: 24), in which Ridley



Fig. 2. A photo by W.J. Gallagher, Government Mycologist, F.M.S., showing "...an exceedingly prolific coconut tree grown on Klanang Estate, Jugra in Selangor...only eleven years old and the total number of nuts on the tree...was more than three hundred and sixty." From H.N. Ridley (1909) *A remarkably prolific coconut*, *Agricultural Bulletin of the Straits and Federated Malay States* 8(7), facing p. 318.

discusses his own simple observations:

The mosquitoes in fact quite ignored the mosquito plant and took no notice of it at all...A writer...rubbed his face and hands with the juice of the leaves. This he found effectively kept the mosquitoes off, but he found next day that he had developed a rash... and eventually for five days his face and hands were as if badly scalded, and he came to the conclusion that the evil was preferable to the remedy...*Editor.*

One or two inconsistencies were also not unexpected. In Ridley's *Curious root-development of Albizzia*, Vol. 7 No. 4 (erroneously printed as Vol. 6 No. 7), April 1908, the article starts by describing roots of *Aleurites moluccana* ascending an oil-palm tree, but ends by referring to the tree as an *Albizzia* as in the title of this short note. *Albizia* (or '*Albizzia*') *moluccana* was the name used then for the leguminous tree we now know as *Falcataria moluccana* (with *Albizia falcataria* and *Paraserianthes falcataria* to add to a colourful synonymy that keeps foresters in awe), and *Aleurites moluccana* is the candlenut tree known for its seed oil. Clearly, even the taxonomist must watch their very busy moments.

In April 1909, Vol. 8 No. 4: 169 carried Ridley's obituary note on Sir George King, late Director of the Botanic Gardens at Calcutta and Director of the Botanical Survey of India, who retired in 1898:

...Sir George King was also the Author of...Materials for a Flora of the Malay Peninsula, which is as yet unfinished...It was originally intended that he in collaboration with Sir Joseph Hooker should publish the complete Flora of the Malay Peninsula, but his death has prevented this from being carried out.

Ridley (1907) had, himself, treated the monocots in three volumes ('Parts'), although the rest of the *Materials* was never completed, comprising 25 instalments that appeared in the Journal of the Asiatic Society of Bengal between 1889 and 1915, with a 26th instalment only in 1936 (Ng & Jacobs 1983). Thus around this time, Ridley had already been active collecting botanical specimens (with many cited in the *Materials*) as well as compiling a flora. As it turned out, the *Materials* was to pave the way for Ridley's five volumes of *The Flora of the Malay Peninsula* (Ridley 1922–1925), which, although it does include a number of astute insights into the classification of Malayan plants, is considered by some scholars as having some apparently hastily written and poorly compiled parts. Given King's uncompleted account (continued to some extent by J.S. Gamble), Ridley's work pressures, the imperatives of having the rich Malayan flora surveyed as a taxonomic package, and the fact that he could only settle in to compile his *Flora* at Kew following retirement, a rapid pace of completion was probably not to be compromised. Even then, the onset of the 1st World War around 1914 had disrupted life. Whatever the criticisms—and awareness of many weaknesses came as soon as the *Flora* appeared: see Holttum (1959)—Ridley's completion of a primary documentation of the Malayan flora was a feat in itself and an accomplishment in discipline. He would be admired for a great many things (Purseglove 1955a, b, c). Purseglove (1959) also commented that Ridley "belongs to that great pre-specialised age of scientific natural history and he collected and studied many animals, as well as distributing specimens and writing about them."

Malaya entered a great rubber boom in 1910. Advertisements apparently made their debut in Vol. 8 No. 12 (December 1909), when four items were carried, from

Howarth Erskine Ltd., Singapore, "makers of rubber machinery"; The Borneo Co., Ltd.; the Journal d'Agriculture Tropicale; and the Sun Life Assurance Company of Canada. These were vignettes of what the region was getting busy with at the time: rubber and agriculture, development and business. In the last two volumes 9 and 10 of this second *Agricultural Bulletin* (1910 and 1911), advertisements had gained in number conspicuously. This was a notable change, a kind of culmination to a very regimented bulletin production that highlighted economic successes through the agricultural programme, more possibilities with potentially profitable crops, and a necessary brevity pervading throughout because of the need to bring issues out very frequently.

The Third Series: birth of the *Gardens' Bulletin*

Ridley retired officially on March 1st, 1912 but had gone on leave by January 18th (Burkill 1913). *The Agricultural Bulletin of the Straits and Federated Malay States, Third Series*, was introduced in this year, somewhat awkwardly, by its No. 1 comprising a 66-page Index for articles and topics of the past *Bulletins* from 1891 to 1911. In the Index, 'OS' stood for the 'Old Series' and '1' to '10' for volume numbers of the 'New' (i.e., Second) Series. Then No. 2 began anew with Page 1. The numbers 1–5 appeared monthly for January to May 1912 and had lead pages declaring *Founded by H.N. Ridley, C.M.G., M.A., F.R.S., & c., in 1891, and edited by him up to 1911*. The Assistant Curator of the Garden, J.W. Anderson, compiled Nos. 1, 2 and 5, and the Curator, R. Derry, compiled Nos. 3 and 4. But not long afterwards, the new Director of Gardens, Isaac Henry Burkill (1913) (Fig. 3) recorded that "In consequence of want of staff the 'Agricultural Bulletin' was suspended after five numbers had been issued."

In the *Planters' Association of Malaya Fifth Annual Report for the year ending 31st March, 1912* published in the *Bulletin* (3rd Series) Vol. 1 No. 4: 137–142, an appreciation of Ridley as well as new arrangements for the *Bulletin* itself were recorded:

MR. RIDLEY.—This gentleman, who was truly the Father of the Rubber Industry in this Peninsula, has retired and left the East, after having devoted many years of his life to benefitting the planting industry...

AGRICULTURAL BULLETIN.—It is a great satisfaction to hear that arrangements have been made for this paper to be edited and published in Kuala Lumpur, as it is one of great use to the Planting Community.

With the development of commercial activities increasing in much of Malaya, organisation to serve the F.M.S. better was being put into effect. The Singapore Botanic Gardens had been an instrument of the S.S. Government for supporting its agricultural development since 1875 and had practically been concerned with the whole of Malaya, but in 1905 the F.M.S. had set up a Department of Agriculture headquartered in its capital, Kuala Lumpur. Agriculture was enjoying a boom. It was only after I.H. Burkill arrived as the new Director on October 17th, 1912, that new arrangements for the publication of the journal were ironed out. This *Bulletin* would continue its No. 6



Fig. 3. The second Director, I.H. Burkill, who consolidated the *Gardens' Bulletin* as a botanical journal. (From the Singapore Botanic Gardens archives)

under a new name, based in Singapore, while the *Agricultural Bulletin of the F.M.S.* would be a different journal, with Kuala Lumpur as its centre of organisation.

Under these circumstances, No. 6 of the *Bulletin* in Singapore appeared as *The Gardens' Bulletin, Straits Settlements* "into which is incorporated all that has been published as the Third Series of the Agricultural Bulletin of the Straits and Federated Malay States" (Fig. 4). The Editor's Note at the start of Vol. 1 No. 6 (issued December 15, 1913) makes the clarification thus—

Since 1891 the Botanic Gardens have had a publication; at first it was an occasional publication, then in 1902 it became a monthly, by a joint agreement with the Governments of the Straits Settlements, and Federated Malay States and the United Planters' Association of Malaya. Now, again, the period of the agreement having terminated, it will be occasional...the title has been changed to avoid confusion with the Agricultural Bulletin of the Federated Malay States. It is thought that the title "Gardens' Bulletin, Straits Settlements" is satisfactorily descriptive, distinctive and conveniently short...The five parts published as the third series of the Agricultural Bulletin, Straits and Federated Malay States, become the first five parts of the Gardens' Bulletin...There will be more original matter...but no market reports and no proceedings of meetings...

Having taken over from his predecessor, Burkill's writing featured conspicuously in the pages of the *Bulletin* from 1913 into the 1920s. The immediate issue, No. 6, opened with his note on *The Coconut Beetles, Oryctes rhinoceros and Rhynchophorus ferrugineus*. Original material came to feature more prominently, mostly emphasising economic botany, including large summaries like *The treatment to which the Para Rubber trees of the Botanic Gardens, Singapore, have been subjected* (Vol. 1 No. 8: 247–295) and, conspicuously, Burkill's own research into yams, e.g., *Experimental cultivation of the Greater Yau Dioscorea alata* (Vol. 1 Nos. 9, 11–12; Vol. 2 No. 2), *Some cultivated Yams from Africa, and elsewhere* (Vol. 2 Nos. 3, 12), *A progress report on the cultivation of the greater yam, Dioscorea alata—in the Botanic Gardens, Singapore* (Vol. 2 No. 4), *Yields of the lesser yam and of some African yams* (Vol. 2 No. 5), and *A list of Oriental vernacular names of the genus Dioscorea* (Vol. 3 Nos. 4–6). Instalments on *The Oil Palm (Elaeis guineensis) in the East* by E. Mathieu appeared in Vol. 2 No. 7: 217–230 and No. 8: 265–275. Articles on lima bean acclimatisation trials, roselle and castor oil cultivation by E. Mathieu, on races of the coconut palm by Ahmed Bin Haji Omar, and the betel palm *Areca catechu* by F. Flippance were included. More notes and data were published on agricultural pests (*Locusts in Malacca* by P.C. Cowley-Brown & I.H. Burkill, Vol. 1 No. 10; *Catochrysops pandava, a butterfly destructive to Cycads* by Burkill, Vol. 2 No. 1; and various notes on beetle pests of the coconut by Professor C.F. Baker, Vol. 2 No. 1) and fungi by Baker (*Host Index for fungi*, Vol. 2 No. 1; *Hevea versus fungi*, Vol. 2 No. 4) and T.F. Chipp (*The fungus flora of Hevea brasiliensis*, Vol. 2 No. 6; *A Host Index of Fungi of the Malay Peninsula*, Vol. 2 Nos. 7, 8; *A list of the fungi of the Malay Peninsula*, Vol. 2 Nos. 9, 10 & 11 combined).

Early on in his tenure as Director, Burkill gathered summaries of the development of the Botanic Gardens. He himself compiled *The establishment of the Botanic Gardens, Singapore* (Burkill 1918a) and *The second phase in the history of the Botanic Gardens, Singapore* (Burkill 1918b). Flippance contributed *A Guide to the*

THE
GARDENS' BULLETIN,
STRAITS SETTLEMENTS.

INTO WHICH IS INCORPORATED ALL THAT HAS BEEN PUBLISHED
AS THE THIRD SERIES OF THE AGRICULTURAL BULLETIN
OF STRAITS AND FEDERATED MALAY STATES.

The Gardens' Bulletin will be published as material becomes
available. Its price is fifty cents a copy, post free, or in
advance for a volume of twelve numbers, post free,

Five dollars in the Straits and Federated Malay States

Nine and a half rupees in India and Ceylon,

Thirteen shillings in Europe.

Subscriptions paid to the third series of the Agricultural
Bulletin, Straits and F. M. S. are counted as subscriptions to it.

SINGAPORE:
THE STRAITS TIMES PRESS, LIMITED.

Fig. 4. The title page of the December 1913 issue No. 6 announcing the journal's name change to *Gardens' Bulletin, Straits Settlements*.

Palm Collection in the Botanic Gardens (Vol. 2 No. 6: 177–186 and No. 7: 246–258). Burkill's interest in more organised platforms for the continuing botanical survey of the Malayan flora is seen in his *Fragments of Malayan Geographic Botany No. 1. Enumeration of Pahang Plants collected by the late A.M. Burn-Murdoch* (Vol. 1 No. 9); *The as-yet botanically unexplored parts of the Malay Peninsula* (Vol. 3 Nos. 1–3); and the classic guide to *Botanical Collectors, Collections and Collecting Places in the Malay Peninsula* published in Vol. 4 Nos. 4 & 5 after retirement (Burkill 1927), which organised its content using a system of grid-square references systematically enumerating the collections known to have been made in particular localities in each state of Malaya.

A special interest in orchids was also noticeable. There were Malayan orchid notes by Burkill and Mohamed Haniff (Vol. 1 No. 10, July 1916), the latter a botanically experienced Overseer in charge of the Waterfall Gardens in Penang and under the Director in Singapore; a paper by Burkill discussing evidence produced to show that Pigeon Orchid (*Dendrobium crumenatum*) flowers about 8 days after heavy rain (Vol. 1, Nos. 11–12, March 1917), following Rutgers and Went's observations of its gregarious flowering in the *Annales du Jardin Botanique de Buitenzorg* (29: 129–160) the previous year; a general article on the flowering of orchids by Burkill (Vol. 2 No. 2); and notes on Southeast Asian orchids by Burkill (Vol. 2 No. 12, August 1921). These and the earlier orchid collections and notes by Ridley were precursor to the interest in Malayan and British North Borneo orchids taken up by the Malayan rubber planter C.E. Carr into the 1930s (Carr had been a frequent associate at the Singapore Botanic Gardens, visiting to study orchids and contributing specimens; he died in New Guinea while returning from an expedition in 1936) (Holtum 1959).

Burkill also put out articles on biological and ecological perspectives. These included *Some notes on the pollination of flowers in the Botanic Gardens, Singapore, and in other parts of the Malay Peninsula* (Vol. 2 No. 5: 165–176, September 1919); and his *The fertility of branched coconut palms* (Vol. 3 Nos. 1–3) was followed by C.X. Furtado's *A study of the coconut flower and its relation to fruit production and Branched coconut palms and their fertility* (Vol. 3 Nos. 7–8). Early ecological studies included *The composition of a piece of well-drained Singapore secondary jungle thirty years old* (Vol. 2 No. 5: 145–157, September 1919) that enumerated trees by species with height and girth data; and *Forests and their retention of rain water* (Vol. 2 No. 12: 419–421). Compiled together with Richard Eric Holtum, his Assistant Director who was appointed in 1922, *A botanical reconnaissance upon the Main Range of the Peninsula at Fraser Hill* (Vol. 3 Nos. 1–3, August 1923) would be an indispensable record of not just seed plants, but also ferns, lycophytes and mosses; this and the included survey of the largest tree sizes on forested ridges by the Semangkok pass (later to inspire the keeping of the so-called Big Tree Plot as a Virgin Jungle Reserve by the Forestry Department: Wyatt-Smith 1950) thus comprise an excellent baseline study of the flora of Fraser Hill. Holtum continued this foray into floristics, as with *The vegetation of Gunning Belumut in Johore* (Vol. 3 Nos. 7–8). But Burkill's study with Murray Ross Henderson of *The flowering plants of Taiping, in the Malay Peninsula* (Vol. 3 Nos. 7–12) was considered by them as "the first local Flora for any area within

the Federated Malay States” and only the third after Charles Curtis’s *Catalogue of the Flowering Plants and Ferns found growing wild in the Island of Penang* (Curtis 1894) and Ridley’s *Flora of Singapore* (Ridley 1900).

Thus a conspicuous diversity of topics and authorship, both agri-horticultural and related to the natural history and botany of Malaya, much of it original contribution, began building up. The bulletin that Ridley founded had been developed into a fully scientific journal by I.H. Burkill, his successor. The earlier preoccupation with agri-horticultural news and developments and commodity reports, when the only agricultural bulletin serving Malaya was co-sponsored by a planters’ association and required Ridley to maintain that coverage, was now largely replaced by scientific notes, reports and papers on a wider range of subjects. The need to sustain monthly issues, and obligations to advertisers who no doubt expected consistent and regular circulation, had been relieved by the calmer, more research-based attitude with the change to the *Gardens’ Bulletin, Straits Settlements*. Perhaps also the development of the F.M.S. Department of Agriculture in the beginning 20th century, with a growing specialisation in technical subjects, was as important as the reformulated objectives of the new *Gardens’ Bulletin* in bringing greater opportunities for organised research and scientific publishing for both the agricultural and botanical sciences. The agricultural component had all but disappeared from the *Gardens’ Bulletin* by 1924.

Colonial reorganisation, economic slump, War, and another name change

In 1918, F.W. Foxworthy, who had served with the Bureau of Science in Manila, was appointed the first Forest Research Officer of the F.M.S. and S.S., stimulating further growth of the fledgling Forest Herbarium in Kuala Lumpur (Wong 1987). Around this time also, other developments pressed for centralisation of botanical research in Kuala Lumpur but this did not materialise, as discussed by Humphrey Morrison Burkill (1983), late Director of the Singapore Botanic Gardens, and summarised here. A proposal to the Colonial Office in London for recruiting a Systematic Botanist in the Museum Department in Kuala Lumpur was made in 1920 by Sir George Maxwell, Chief Secretary of the F.M.S. and in 1921, M.R. Henderson was appointed to this post. As the development of both agriculture and forestry became more organised and important in Malaya, the colonial government decided to centralise botanical research in Kuala Lumpur to better support these areas. A meeting in December 1923 attended by G.E.S. Cubitt (Conservator of Forests, S.S. and F.M.S.), A.S. Haynes (Secretary for Agriculture, S.S. and F.M.S.) and I.H. Burkill discussed arrangements to move the Singapore Herbarium and the research of the Singapore Botanic Gardens to new premises in Kuala Lumpur, to absorb the botanical research of the Museum Department and its Systematic Botanist into the new botanical department, and to develop the Public Gardens in Kuala Lumpur as a botanic garden with the existing ones at Singapore and Penang as branch gardens. In the F.M.S., administrative dithering led to a delay in implementation and Maxwell only agreed to the new botanical department

in Kuala Lumpur in 1926. The rubber slumps of 1921 and 1924 preceded a more serious worldwide slump in 1929 and brought adverse consequences for government spending in colonial Malaya. The Museum Department's Systematic Botanist post was abolished and by I.H. Burkill's intervention, Henderson was brought to the Botanic Gardens, Singapore as Curator of the Herbarium in 1924. No further planning for the development of the Kuala Lumpur Public Gardens appears to have been undertaken, and the move to bring Singapore-based botanical resources to Kuala Lumpur was abandoned (Burkill 1983).

The effort to provide more specialist services in forestry research in Malaya, meanwhile, was assisted when in 1925 the Regent of Selangor approved the allocation of 800 acres at Kepong, near Kuala Lumpur, for the establishment of the Forest Research Institute (Watson 1950, Menon 1969). Its nursery and experimental plantations were begun on site in 1926, and the main building was constructed in 1929. Parallel to these developments, Ridley's *Flora of the Malay Peninsula*, in five volumes (Ridley 1922–1925), was published, having occupied his main attention based at the Kew Gardens following retirement. I.H. Burkill, the second Director who so ably crafted a more focussed scientific direction for the Singapore Botanic Gardens, retired in February 1925, and concentrated on writing and compiling *A Dictionary of the Economic Products of the Malay Peninsula* (Burkill 1935), which would appear a decade following Ridley's *Flora* (Furtado & Holttum 1960). Even so, in the years that followed, Burkill's notes and papers continued to appear in the *Gardens' Bulletin*, including more notes on yams and various other plants, with taxonomic notes and revisions, and even ethnobotanical notes on *The Chinese Mustards in the Malay Peninsula* and *Cosmos in the East* (Vol. 5 Nos. 3–6, June 1930).

R.E. Holttum, Assistant Director to I.H. Burkill, became Director in 1925 and there was some expectation that his work on ferns would lead the preparation of a cryptogam flora for Malaya to complement Ridley's seed plant flora. Indeed, work by Holttum and the Danish Carl Christensen on ferns began appearing during this period, including an account of Mt Kinabalu ferns in Vol. 7 Part 3, June 1934. But in the tropics it is seldom possible to stay on one study and not notice the many other manifestations of nature and life. Holttum's classic studies of plant phenology, *On periodic leaf-change and flowering of trees in Singapore* (Vol. 5 Nos. 7 & 8, June 1931; Vol. 11 Part 2, November 1940) and *The flowering of Tembusu trees (Fagraea fragrans Roxb.) in Singapore 1928–1935* (Vol. 9 Part 1, December 1935) were thus inevitable.

Also, new work in any part of the flora being re-examined was accruing additions and changes easily. This was certainly true with specialist work on the Dipterocarpaceae, the predominant big-tree family in Malayan forests, by C.F. Symington, who joined the Forest Research Institute in 1929 (his *Notes on Malayan Dipterocarpaceae* I to V in the *Bulletin* spanning 1933 to 1939). It also applies to the research on palms and aroids by C.X. Furtado (who joined the Singapore Botanic Gardens as Field Assistant in 1923, then later was Botanist) (Alphonso 1980); new discoveries or revisions of orchids by C.E. Carr; and the research on ferns and orchids by Holttum; and their other colleagues. Henderson also compiled *The Flowering*

Plants of Kuala Lumpur, in the Malay Peninsula (Vol. 4 Nos. 6–10, January 1928) and specially conducted surveys of the Malayan limestone flora. As botanical work intensified and got the attention of more specialists, not least because Ridley's *Flora* provided an accessible and organised overview, the Malayan flora was fast gaining additional interest. Henderson, who re-arranged the Herbarium following Ridley's *Flora*, had *Additions to the Flora of the Malay Peninsula* in Vol. 4 Nos. 2 & 3 (March 1927) and Nos. 11 & 12 (January 1929) (with Furtado), and further additional listings in Vol. 5 Nos. 3–6 (June 1930) and Vol. 7 Part 2 (May 1933). E.D. Merrill, too, had *Additions and corrections to Ridley's Flora of the Malay Peninsula* (Vol. 8 Part 2, January 1935).

E.J.H. Corner, who arrived in Singapore as Assistant Director of the Botanic Gardens in 1929 and a mycologist, would not be able to resist an interest in the palms and trees of Malaya. His *Notes on the systematy and distribution of Malayan phanerogams* and taxonomic work on *Ficus* began appearing in the *Gardens' Bulletin* Vol. 10 (1939) and continued 1960–65 from the University of Cambridge. His debut publication in the *Bulletin* was *The identification of the Brown-root fungus* (Vol. 5 No. 12, June 1932). In this paper, Corner's special acumen for graphical representations showed clearly in his diagrams of microscopic structures. His later work would show a special talent for watercolour illustration of mushrooms to represent subtle differences in tone, as well as the classic line-drawings of plant parts, trees and other figures made famous through his *Wayside Trees of Malaya* (Corner 1940), and even landscapes (Corner 1965, Mandalam 2011).

The *Gardens' Bulletin* was fast taking on a distinct systematic slant. Furtado added an interest in botanical nomenclatural matters, fuelled by his interaction with Professor H. Harms from Berlin, editor-in-chief of the International Rules of Botanical Nomenclature, ed. 3. There was an apparent burst of productivity over Vol. 5 (August 1929–June 1932) and Vol. 6 (1929–1930). The overlap is unusual and is likely due to the availability for the latter volume of three sizeable specialist accounts on medicinal plant use coordinated by I.H. Burkill after settling into his retirement: David Hooper's *On Chinese Medicine: Drugs of Chinese pharmacies in Malaya*, Burkill & Mohamed Haniff's *Malay Village Medicine*, and J.D. Gimlette's edition of an 1886 translation of *The Medical Book of Malayan Medicine* with botanical determinations by Burkill. Still, the frequency of volumes was essentially occasional. Volume 7, for example, had three parts, one each in 1932, 1933 and 1934. Furtado was on half-pay for a year from April 1933 to May 1934, travelling through Europe to work on the palm collections of key institutions. He was mainly at the Berlin Botanical Garden in conjunction with Professor M. Burret (then the leading palm specialist, who assembled the type specimens of Martius from Munich and other material for Furtado's studies); and then London, Vienna, Florence and Paris (Johnson & Tay 1999).

Vol. 9 Part 1 (December 1935) was dedicated to Ridley for his 80th birthday (Fig. 5): "...Few men have accomplished so much in 23 years of tropical service, and few have been able to complete their work after retirement as Mr. Ridley has completed it." B.J. Eaton, Director of the Rubber Research Institute of Malaya, observed that "In addition to continuing his publications on the flora of Malaya, he [Ridley] is still

a member of the Technical Sub Committee of the London Advisory Committee for Rubber Research (Ceylon & Malaya) and thus continues at the age of 80 to maintain his interest in an industry of which he may be said to have witnessed the birth."

The "War volume", Vol. 11, is of special significance. It had Parts 1-4, spanning May 1939 to September 1947. World War II arrived with the Japanese military in Singapore in 1942, so the first three parts (Part 1, May 1939; Part 2, November 1940; Part 3, August 1941) were still issued as the *Gardens' Bulletin, Straits Settlements*. Following the Japanese surrender and the return of Allied forces to Singapore, the political push for a Malayan Union (comprising Penang and Malacca from the former S.S., the F.M.S. and other states of Malaya, but excluding Singapore) was consolidating. It was only in September 1947 that Part 4 was issued to complete the volume, under the new name *Gardens' Bulletin, Singapore*. An insert, taking the place of pages 261-262, before the start of Part 4 proper on page 263, announced the consequence of the new political imperative:

CHANGE OF TITLE

The Colony of the Straits Settlements has ceased to exist. The title of this Bulletin is now therefore changed, but the present issue is a direct continuation of the former *Gardens' Bulletin, Straits Settlements*, of which the last issue was Vol. XI, part 3, published 30 August 1941.

Part 4 of Vol. 11 opened with a crisp record of events at *The Singapore Botanic Gardens during 1941-46*. At the time of the War, J.L. Pestana (Laboratory Assistant), J.C. Nauen and G.H. Addison (Horticultural Officers) joined the defence forces, were taken prisoner and sent to the Siam-Burma railway, where Nauen died in 1943. Henderson was evacuated from Singapore and later worked in the National Botanic Garden at Kirstenbosch in South Africa. Holttum, Corner and Furtado remained in Singapore during the Japanese occupation. The Herbarium and most of the Gardens remained undamaged, as Professor Hidezo Tanakadate of the Tohoku Imperial University assumed control of the Gardens and Holttum was retained in executive charge. In December 1942, Kwan Koriba, who had served as Professor of Botany at the Imperial University of Kyoto, was made Director of the Singapore Botanic Gardens. [Koriba was interested in physiological and ecological factors influencing plant morphology, especially flower and leaf disposition, and had done some work on orchids previously, although this was not highlighted in Singapore then (Arditti 1989).] Following Japanese surrender, the Gardens were placed under British Military Administration between September 1945 and March 1946, and in May 1946, Holttum returned to duty as Director, a post he held until 1949, when he became the inaugural Professor of Botany in the University of Malaya. Henderson became his Assistant Director. After war ended, Corner left for Latin America in 1947 on UNESCO service (thence to a lectureship in taxonomy at the Botany School in Cambridge University, becoming professor in 1965).



Fig. 5. Ridley close to his 80th birthday. *Gardens' Bulletin, Straits Settlements* Vol. 9 Part 1, facing page 1.

Koriba had returned to Japan in 1946 and retired to publish two books, then became the President of Hirosaki University in 1954. Koriba's research undertaken while at Singapore, *On the periodicity of tree growth in the tropics*, was published in the *Gardens' Bulletin, Singapore* Vol. 17 Part 1, November 1958, following his death in December 1957. In an obituary note, Holttum (1958b) wrote:

At Singapore...[Koriba] was dependent on the military organization for funds and supplies of all kinds, and took every opportunity of securing such amenities as were possible for the gardens staff. On several occasions he took energetic action to prevent encroachment on the Nature Reserves of Singapore...He was also greatly concerned that the herbarium and library at the Gardens should be maintained intact. To his single-minded devotion to botanical science the Singapore Botanic Gardens owes much...

In the author's preface to *A Revised Flora of Malaya, Vol. I. Orchids of Malaya* (Holttum 1953), Holttum recorded:

The main part of the work of the preparation of this book was carried out during the Japanese occupation of Singapore...The fact that I was able to undertake the work in the years 1943–1944 was due to the courtesy of Dr. Kwan Koriba, who was sent...to take charge of the Botanic Gardens here. I wish to express my most grateful thanks to Dr. Koriba, for the courtesy with which he allowed me complete freedom to continue my studies, and for much personal kindness during that period.

The sanction of Koriba's authority and that of his superiors, and the wealth of research materials already at the Botanic Gardens, had permitted some intensive preparation for botanical accounts that included *The Zingiberaceae of the Malay Peninsula* (Holttum 1950) and *Ferus of Malaya*, which appeared as Vol. 2 of the *Revised Flora* series (Holttum 1954).

The botanical spirit was refired at the Gardens. There was a great deal more to understand about the flora of Malaya and the region, and plenty to discover. To this renewal James Sinclair arrived at the Singapore Botanic Gardens in 1948, as Curator of the Herbarium, a post that was re-titled Keeper of the Herbarium in 1955 and Botanist (Keeper of the Herbarium) in 1960. The research programme when Sinclair arrived was to prepare a revised Flora of Malaya, for which he was asked to research the Annonaceae.

There is no telling how well a centralised botanical research facility of the S.S. and F.M.S. in Kuala Lumpur would have withstood the War, had earlier colonial plans been realised for bringing Singapore-based resources to Kuala Lumpur, given the looting and other damage inflicted on the Forest Research Institute during the Occupation (Wong 1987). In contrast, the research facilities of the Singapore Botanic Gardens were reasonably well preserved (Corner 1946, 1981; Holttum 1958b). On hindsight, it does seem fortunate that the merger never took place, as otherwise the overall damage to herbarium resources could have been even greater. And, of course, the *Gardens' Bulletin, Singapore* may never have seen its naming as such and its continuity into the present time.

The 1950s and 1960s: two centenaries and increasing regional focus

Ridley's hundredth birthday was celebrated by the Botanic Gardens on 10th December, 1955. According to the Director John William Purseglove (1959), there was "an exhibition of Ridleyana and current work, while the Gardens were floodlit for one week. A special brochure for private circulation was produced for the occasion [Purseglove 1955c]." Ridley wrote "It is a great delight to me to have lived to see the Gardens, the best tropical Gardens in the world," and that his hundredth birthday was one of the most enjoyable days of his life (Purseglove 1959).

In the *Bulletin* issue marking a hundred years of the Singapore Botanic Gardens (Vol. 17 Part 2, December 1959), messages and reflections from former Directors I.H. Burkill (1912–1925), R.E. Holttum (1925–1949), J.W. Purseglove (1954–1957), and the then Director H.M. Burkill (who first was Assistant Director from 1954), the son of I.H., the father then 89, were presented alongside those from many other botanical figures (Purseglove's was reprinted from a 1957 article). It would appear to be something of a feat that four Directors had their writings in the same issue, including both Burkills. H.N. Ridley, the first Director, had died just three years before in 1956, aged 101. And M.R. Henderson, Director during 1949–54 and having retired, had severed most professional contacts and gone to live in the Scottish hills (Burkill 1983).

Although the Gardens were a hundred years old, Purseglove (1959) saw it fit to reiterate their essential features, aware of the risk of repeated opportunities for their erosion. He took the trouble to emphasise—

...botanic gardens, to merit the name, are gardens maintained for the scientific study of the plants. As soon as this vital function is neglected botanic gardens change to public parks...The Singapore Botanic Gardens are the last gardens in the British tropics which function as a separate and self-contained department and have never been under the control of any Agricultural Department, Municipality or University...The southern end of the Gardens was probably abandoned gambier land, a haunt of tigers, while the north was still virgin tropical evergreen rain forest, 11 acres of which are still preserved...a most valuable asset in the centre of a great city.

This article by Purseglove (1959) was brought up to date by a footnote inserted by H.M. Burkill, who recorded thus:

The penultimate constitutional step in the introduction of full internal autonomy of Singapore (effected in May 1959) was operative from April 1955. As befits a country in charge of its own affairs, the Singapore Government adopted a policy of "malayanisation" of the public service from January 1st, 1957. J.W. Ewart retired in March 1957 in accordance with this policy, and A.G. Alphonso, who had returned in 1956 from a two year course of training in horticulture at the Royal Botanic Gardens, Kew, England, was promoted Curator. J.W. Purseglove retired voluntarily in March 1957, and H.M. Burkill became Director. H.H. Addison retired in February 1959. Chew Wee Lek was appointed Botanist in 1956 and went to Cambridge, England, in 1957 for three years to study for a higher degree. Lam Hin Cheng was appointed Horticultural Assistant in July 1957 and went to the Royal Botanic Gardens, Kew, for a two year course in horticulture. The new post of Librarian was eventually filled in April 1958, and Tan Kim Ho went to Melbourne, Australia, in 1959 for training in library management on an Australian

Government award under the Colombo Aid Programme. Attempts to fill the post of Assistant Director were unavailing, and finally Miss Chang Kiaw Lan was appointed Botanist (vice Assistant Director) to take up a study of mycology...The last three years, 1957 to this centenary year of 1959 have been a period of transition characterised by an acute shortage of senior personnel through loss of qualified staff and temporary loss of the services of officers sent overseas for training...Thus will close a century of expatriate know-how in the senior botanical and horticultural posts, and there will open the second century of the Gardens' history, every bit as promising in the comity of international botany as the first has been successful, with the majority of the senior posts held by Malayan personnel.

Following emergence from the war, reorganisation had been intense in the Botanic Gardens, where "garden work deteriorated generally, as more than half of the out-door staff (49 men) were sent to work on the Siam-Burma Railway...22 of them lost their lives" (Purseglove 1959). With senior staff having to attend to all sorts of duties, it was then that publication lapses were especially evident and the *Gardens' Bulletin* was not issued during the years 1948, 1952, 1954 and 1957, even though it was following an occasional mode.

It was the period after the war that saw an even wider involvement in the botany of the Southeast Asian region: this would have been reinforced as a necessity with the consolidation of the *Flora Malesiana* project encompassing much of the Malay Archipelago (Stenis 1948):

...the *Flora Malesiana* should embrace as wide an area as possible...no species can be properly defined, until it has been examined in all variations induced by the differences in climate, locality, and soil, which an extensive area affords. Also, the flora of an area cannot be worked out thoroughly without a knowledge of the botany of the surrounding countries (these have many plants in common), and so the greater the area encompassed, the better it will illustrate habits, forms, and variations of the species comprised within it. For this reason we have extended the limits of our *Flora* from Sumatra to New Guinea and from Luzon to Christmas Island, Timor and New Guinea.

Although the work of Ridley had not entirely focussed on Malayan botany in isolation, and there was in fact a fascination and interest in the plant life of the surrounding region, the priority then was to complete a Malayan account. A wider, regional botanical perspective became more visible and important with the work of I.H. Burkill (who revised the Dioscoreaceae regionally for the *Flora Malesiana*: Burkill (1951), in retirement and at age 81, based on earlier monographic work undertaken with Sir David Prain) (Holtum 1967) and his colleagues.

Holtum's concentrated experience during wartime internment in working out the orchids and gingers was reasonably successful only because of the availability of good living collections and specially collected specimens with good field notes and flowering parts in spirit; these were not available to the older accounts, causing much inaccuracy and taxonomic confusion. He was interested to research further monocot groups in which study was similarly disadvantaged. Bamboos are notoriously difficult because botanists have tended to name species based on flowering material, most often produced when the living plants are lacking fresh shoots with more easily seen features. As bamboos may tend to be in entirely vegetative (non-flowering) states

for prolonged periods, the early accounts that did not record adequate features were essentially useless as identification tools. Incorporating the missing information for an improved understanding demands specialised collecting and recording of features, a feat much aided by the existence of special living collections for a region's bamboo flora. His revision of Malayan bamboos (Holtum 1958a) had sought perspectives from the surrounding region, including living bamboos maintained in the more established Calcutta and Bogor collections. This seminal account in the *Bulletin* also included his perspective that the historical migration of peoples through Southeast Asia could have brought selected clones (especially the larger, more useful *Dendrocalamus* and *Gigantochloa* taxa) to Java and Peninsular Malaysia, where they are apparently known only in cultivation without any documented wild conspecifics. These are now recognised as “ancient enduring clones” (Muller 1999) and there is now evidence that some must have been selected from hybrid swarms that do naturally occur in our landscape (Muller 1998, Goh et al. 2011). This situation is especially relevant to the region from India and Myanmar through South and Indo-China, into the Malesian area. Understanding these basic premises point the way to more careful approaches in conserving valuable genetic materials selected through the ages.

There are *G. robusta* clumps planted in the Bogor Botanical Garden in 1844 during the time of the botanist Hasskarl that have remained alive for over 150 years (at least, they did not die from flowering, if any) and so are good subjects for agriculture (Wong 2004). Likewise, in discussing *Orchids, gingers and bamboos: Pioneer work at the Singapore Botanic Gardens and its significance for botany and horticulture* in the *Bulletin*, Holtum (1959) mentions a village bamboo from northern Malaya introduced to the Singapore Botanic Gardens that has persisted in vegetative state for decades; this is *G. ridleyi*, distinctive yet named without flowers (by Holtum to commemorate Ridley, who introduced it). This bamboo lives even now, over a century since its introduction, continuing its flowerless state. Holtum (Fig. 6) died in 1990, at the age of 95.

Steenis (1959) and Lam (1959) have further highlighted the virtues of a *Flora Malesiana* approach. Similarly, Corner settled into deeper research with Asian and Australasian *Ficus* at Cambridge, beginning on a worldwide perspective in *The Classification of Moraceae* (Corner 1962), and later led two Royal Society expeditions to Mt Kinabalu in 1961 and 1964 (Mandalam 2005). At the same time that Sinclair worked on Malayan Annonaceae, he reviewed material from India, Burma, Thailand, Borneo and New Guinea, publishing papers on interesting taxa. After his monograph of Malayan Myristicaceae (Sinclair 1958a), the taxonomic emphasis in Singapore began shifting towards closer collaboration with the Flora Malesiana Foundation (Burkill 1968). This was reflected in his *Florae Malesianae Precursores* XX, XXXI, and XLII published in the *Gardens' Bulletin, Singapore*, on *Gymnacranthera* (Sinclair 1958b), *Knema* (Sinclair 1961), and *Myristica* (Sinclair 1968, posthumously), respectively. Sinclair was retired prematurely in 1963 because of the “malayanisation” programme but re-engaged on contract until 1965, then stayed on at the Botanic Gardens as an honorary researcher until 1967. He also completed manuscript work on *Horsfieldia*, which was only retrieved from the Kew Herbarium following his death in 1968 and

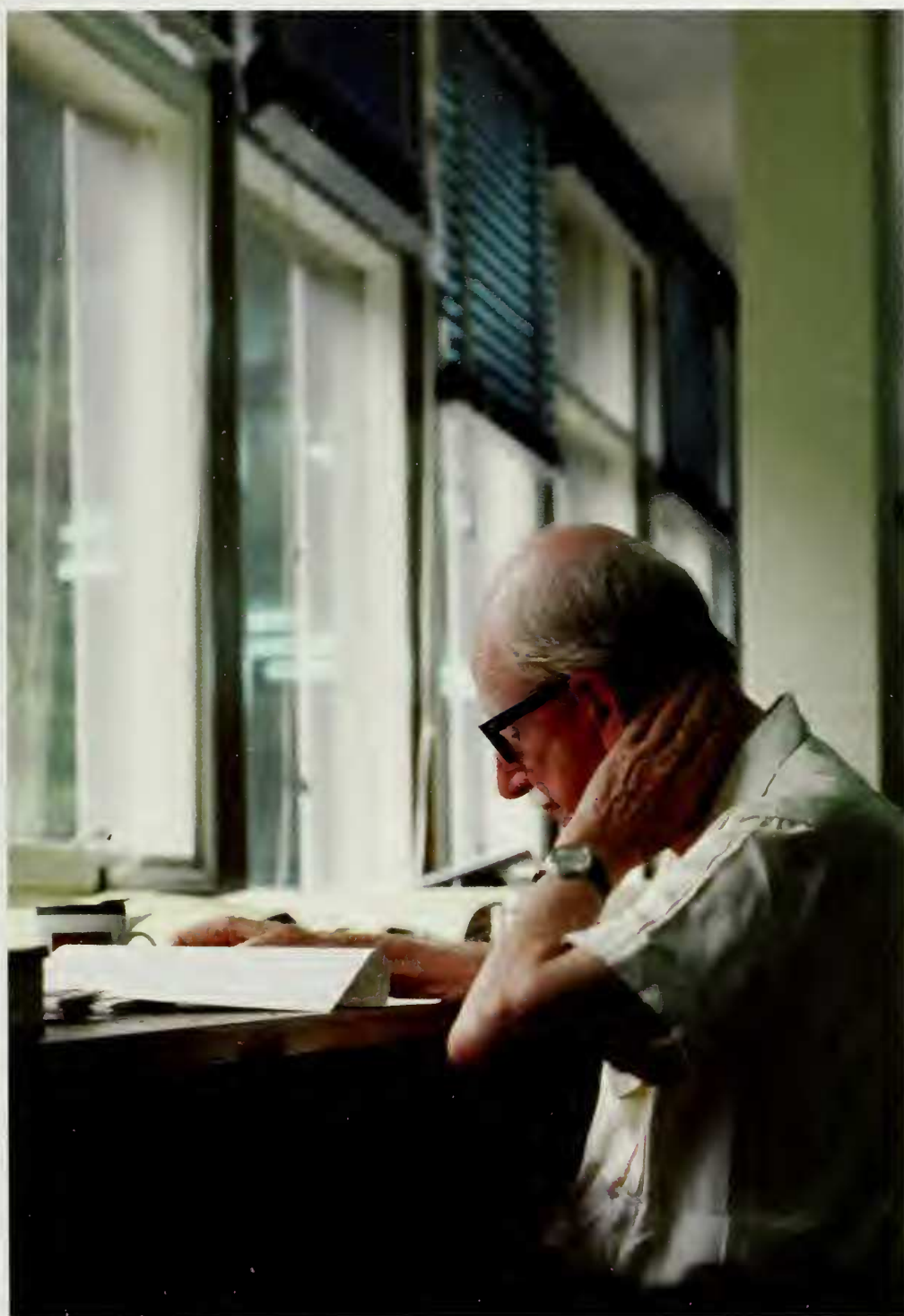


Fig. 6. R.E. Holttum in 1981. (Photo by K.M. Wong)

subsequently published in the *Bulletin* (Sinclair 1974, 1975). Chew Wee Lek's doctoral dissertation work supervised by Corner resulted in the latter's *Florae Malesianae Precursores* XXXIV on *Poikilospermum* (Chew 1963). The *Flora Malesiana* effort was also able to attract the participation of Hsuan Keng, based at the University of Singapore, resulting in *A revision of Malesian Labiatae* (Keng 1969).

Possibilities for participating in reciprocal research support with other countries probably became better established during this period, when H.M. Burkill was Director of the Singapore Botanic Gardens. Chew's research on *Laportea* and allied genera (Chew 1965, 1969a, b) was enhanced by the opportunity in 1964 to visit the herbaria of Cambridge, Kew, British Museum, Paris, Geneva, Leiden and Utrecht on a Royal Society Nuffield Foundation Commonwealth Bursary gained through Corner's support. This worldwide survey even enabled Chew's diagnosis of the new Central American genus *Discocnide*! On the other hand, revisions of *Petraeovites* (Munir 1965) and *Symphorema* (Munir 1967) by Munir Ahmad Abid from the University of Sind, Pakistan, were possible with a Colombo Plan Fellowship through a Government of Singapore award to visit the Singapore Botanic Gardens in 1964 and 1965.

A very broad range of papers—from cryptogamic to seed plant subjects, covering taxonomy, morphology, evolution, physiology, ecology and conservation, and including country-specific or more regional geographical scopes—was now carried in the *Gardens' Bulletin, Singapore*. Thus, just about anyone working consistently with the botany of the Southeast Asian region, and occasionally elsewhere, began to publish with the journal. Somewhat opposite in direction, there was a “malayanisation” programme that sought to fill key positions with as many locally domiciled persons as possible, but meanwhile, the research scope (in tune with the imperatives of new scientific development) was going towards regionalisation and fast gaining an international dimension.

The Gardens in a Garden City

Less than 20 years after the admonishment by Purseglove (1959) regarding maintaining the close relationship between botanic gardens and science, further challenges were to appear when taxonomic research waned. Chang Kiaw Lan, who obtained her doctorate in mycology working under Corner at Cambridge, had returned as Botanist to the Gardens in 1965 but what would be her office in the new Herbarium building completed in 1964 was still occupied by James Sinclair (Wong 2003). Work on orchid culture was already underway with Hardial Singh, another Botanist engaged in 1963, but the development of facilities for Chang's experimental work in basidiomycete fungal development also needed to wait. In 1967, as Sinclair left, the Garden City Campaign was emphasised and Chang was asked to take charge of advisory work under this programme. Less than a year later she was seconded to the Primary Production Department, who wanted to begin mushroom cultivation research. Just over a year later, July 1969, after Chew Wee-Lek signalled there was an “acute shortage of botanists in the Botanic Gardens” with the retirement of H.M. Burkill, Chang was returned to the

Gardens; Chew succeeded Burkill and Chang became Keeper of the Herbarium in 1970. Unprecedented for a Director of the Gardens to serve just several months, Chew himself left Singapore in 1971.

In 1973 it was decided to merge the Botanic Gardens with the Parks and Trees Branch of the Public Works Department to form the Parks and Recreation (P & R) Division (Anonymous 1974); this became a full department in 1976 (Ministry of National Development 1977). There was more reorganisation. Geh Siew Yin, who trained under Hsuan Keng at the University of Singapore and was employed as Botanist in 1971, was moved to more administrative duties as Assistant Commissioner of the Garden in 1973. After Geh, no new taxonomists were recruited for another two decades (Kiew 1999). By 1975, Hardial Singh was also transferred to non-research duties in P & R and only Chang was left to keep the Herbarium going. All this was an incredible rate of flux in the Botanic Gardens research outfit, which had, in the first place, run on only a skeleton staffing of a handful of mainly taxonomic botanists. H.M. Burkill (1993) deplored this decline and the notion that a botanic gardens of standing could function effectively without strong research support for its collections, education and conservation programmes.

Chang (Fig. 7) had a superb command of languages, was an able editor and prolific correspondent who kept in touch with a great number of botanists worldwide and their requests for information and assistance (Wong 2003), and ably coordinated the stay and activities of visiting scientists at the Singapore Herbarium. This encouraged many botanists internationally to contribute to the *Gardens' Bulletin*. There was still an inflow of manuscripts from former Gardens staff members, including Corner and Holttum, and a number from Keng, Wee Yeow Chin and A.N. Rao and their students from the University of Singapore. Corner's *The Freshwater Swamp-Forest of South Johore and Singapore* (Corner 1978) became the first supplementary issue of the *Gardens' Bulletin*, simply enumerated as "Supplement no. 1". Also at around this time, Keng's series on the *Annotated list of seed plants of Singapore*, which would become the longest-spanning series published entirely in the *Bulletin* by a single author, appeared in 1973 (instalment I); subsequent instalments were published in 1974 (II and III), 1976 (IV), 1978 (V), 1980 (VI), 1982 (VII), 1983 (VIII), 1985 (IX), 1986 (X), and 1987 (XI). [Furtado's series from a different time, *Palmae Malesicae* (with 19 instalments spanning 1934–1956) was longer but the first part was published in the Berlin-based *Feddes Repertorium*, not the *Gardens' Bulletin*.] The *Limestone hill flora of Malaya* by S.C. Chin of the University of Malaya, which updated and extended Henderson's work previously, appeared in four instalments beginning 1977 and continuing in 1979 (Part II) and 1983 (Parts III and IV). Chang's co-editing or editing, respectively, of the festschrifts for Corner (Vol. 29: Mabberley & Chang 1977) and Holttum (Vol. 30), came out admirably and on these occasions a special taxonomic shine returned to the Gardens. At this time, because of a greater research emphasis by P & R on horticultural matters, there was also an increase in papers reporting experimental horticultural investigations (both in the laboratory and field).

Abrupt changes came to the management of the *Gardens' Bulletin* for Vol. 31 Part 2 (December 1978). Asked to manage other aspects, Chang left the editorship



Fig. 7. Chang Kiaw Lan at her editing desk in December, 1974. (Photographer unknown, courtesy of Christina Tan)

and was succeeded, for short periods, by Hardial Singh (Vol. 31 Part 2, Vol. 32), Y.S. Choo (Vol. 33 Parts 1 and 2), and J.F. Maxwell (Vol. 34 Part 1). Then when Geh chaired the editorial committee in place of the head of department who resigned, she also had to take over as editor from Vol. 34 Part 2 (December 1981) and brought back Chang's expertise to assist with the *Bulletin*. Chang became managing editor from 1982 until 1987, when she retired, whereupon the editorship was managed by Geh until Chin See Chung was appointed Keeper of the Herbarium and jointly edited from 1993 (Vol. 45) to 1996 (Vol. 48), when he became Director and Geh relinquished her role to concentrate on another responsibility. T.W. Foong was also co-editor of the *Bulletin* for 1995–1996. The *Bulletin* had literally gone through thick and thin, through a difficult period when taxonomic productivity in its own home was at an ebb, and it was Chang and Geh who plodded on with the work that kept the journal reasonably well. As it turned out, this perseverance was significant because it brought the *Bulletin* through a phase when in-house contribution was much lower than ever before. This remarkable survival has developed a distinctly international flavour that has kept up with scholarly expectations in scientific publishing: a significant volume of the contributions coming from an international field of authors attracted to good standards in editing, peer review of material, printing quality and timeliness of production.

Besides the broadened array of international contributions, several lines of work brought out through the *Bulletin* are of special note for the Malay Peninsula and for Singapore. Ian Turner, a taxonomist and ecologist and sometime Assistant Director in charge of Horticulture at the Singapore Botanic Gardens, published *A*

Catalogue of the Vascular Plants of Malaya (Turner 1995), summarising efforts as far as possible to present Malayan taxa with their most currently accepted names. Two series of contributions mainly coordinated by National University of Singapore botanists became visible, *The angiosperm flora of Singapore* (Tan et al. 1992a, and onwards) and *Additions to the flora of Singapore* (Tan et al. 1992b, and onwards). A *Field Guide to the Grasses of Singapore* (Duistermaat 2005) was published as Supplement to Vol. 57 of the Bulletin, a departure from separate numbering of earlier supplements. Taxonomic work on orchids was re-emphasised somewhat with J.J. Vermeulen (2000, and onwards) on the staff for some years, and Peter O'Byrne having taken up residence in Singapore. Also, Ruth Kiew's research on *Begonia*, besides her other work that is often reported in the *Bulletin*, culminated in a Peninsular Malaysian account (Kiew 2005).

There was redoubled interest in the biodiversity of Singapore itself. Greater attention was focussed on the ecology of trees at the Bukit Timah Nature Reserve (Wong 1987, Swan 1988) and the Central Catchment Nature Reserve (Wong et al. 1994), and a wider stocktaking of biological communities with *Rain Forest in the City: Bukit Timah Nature Reserve, Singapore* (Chin et al. 1995). In 1993, a 2-ha permanent ecological plot was set up in Bukit Timah that joined a long-term network of research plots in tropical forests around the world coordinated by the Center for Tropical Forest Science (CTFS) of the Smithsonian Tropical Research Institute, in partnership with the Nanyang Technological University's National Institute of Education and the National Parks Board (LaFrankie et al. 2005). Chan & Corlett (1997) edited a special part on *Biodiversity in the Nature Reserves of Singapore*. Turner et al. (1996) continued a long-standing interest in local ecology in the Bulletin with a new appraisal of the freshwater swamp forest in Singapore.

The effort to resuscitate the taxonomic sciences at the Singapore Botanic Gardens only gained in pace when the orchidologist Tan Wee Kiat became Director of the Singapore Botanic Gardens in 1989. Around this time, the opportunity for reorganisation identified a National Parks Board as an ideal body for incorporating a larger emphasis on environmental and biodiversity conservation in its management of Singapore's green spaces and biological resources. With all the reorganisational flux, the *Gardens' Bulletin* was not issued during 1990, the only time since the Second World War period when issues missed some years! When Tan became Executive Director of NParks (as the organisation came also to be known) in 1990 (concurrently still Director of the Gardens), taxonomic activity was restored. Tay Eng Pin, a taxonomist and morphologist who trained with Francis Hallé and had served in various capacities with P & R and then NParks, was asked to take charge of the Keeper's duties as Senior Research Officer (Taxonomy) from 1990 until 1993, when he left and Chin, an ethnobotanist and forest botanist who had studied with D.M. Smith, H.C. Conklin and Benjamin C. Stone, was appointed Keeper and Senior Research Officer (Plant Introduction). Tan became Chief Executive Officer of NParks in 1996, and Chin was made Director of the Gardens. Ruth Kiew (another student of Corner's) was appointed Keeper of the Herbarium and concurrently was Editor of the *Bulletin*, 1997–2006; succeeded by Benito Tan, 2006–2010, and the present author from 2010.

Hindsight a hundred years on

The development of the *Gardens' Bulletin, Singapore* can be traced from its roots as a monthly bulletin. It provided reports of agricultural development and commodities and occasional notes and articles of interesting crop and wild plants of its immediate region, which was actively opening up for agricultural and other industries through colonial development. Its transformation has been mediated by historical events, from the enlargement of administrative and economic divergence between the Straits Settlements and the Federated Malay States, to World War II, and the “malayanisation” period during which the post-war British administration gave way to independence and much reorganisation.

The *Bulletin* was reoriented as a scientific periodical during the time of I.H. Burkill. Scientifically, the scope has diversified from an essentially “Malayan” perspective painstakingly documented and refined through the primary efforts of a small team of in-house botanical personnel at the Singapore Botanic Gardens, to a more regionally relevant publication avenue in parallel with the larger floristic insights of Flora Malesiana, and finally a journal with an international outlook. This development appears inevitable, as at first, British Malaya was a natural unit largely flanked by Dutch-held territories across the Malay Archipelago, and as the unfolding science revealed much more about the region’s floristic limits and extreme biological richness, a greater regional and then international perspective was necessary for meaningfully continuing both science and development. The key ingredients that fuel this development have, at all stages, involved persons with specialised botanical training who had an unusual appetite for their science and steadfastness of scholarship and purpose. Above all, they had a great respect for continuing a heritage accrued through the changing fortunes of boom and ebb, and between prosperity and adversity.

‘We have a vision for our time, but we can be certain that it will not be the last.’

Richard Fortey, *Earth* (2005)

ACKNOWLEDGEMENTS. I thank Ms Christina Soh for expert assistance with archived historical material in the Library of the Singapore Botanic Gardens, Y.W. Low for raising the centenary alarm and assistance in compiling publication data for *Gardens' Bulletin* issues, and Dr. Nigel Taylor, Director of the Botanic Gardens, for encouraging this centenary record and useful comments. A near-complete set of the *Gardens' Bulletin, Singapore* inherited from Dr. S.C. Chin provided useful insight into the workings of the botanic gardens, herbarium and journal.

References

- Alphonso, A.G. (1980) An obituary—Dr. Caetano Xavier Furtado (1897–1980). *Gard. Bull. Singapore* 33: 301–302.

- Anonymous (1974) Report of the Botanic Gardens for the year 1973. *Gard. Bull. Singapore* 27: 221–245.
- Arditti, J. (1989) Kwan Koriba: botanist and soldier. *Gard. Bull. Singapore* 42: 1–17.
- Brockway, L.H. (2000) Science and colonial expansion: The role of the British Royal Botanic Gardens. *Amer. Ethnol.* 6: 449–465.
- Burkill, H.M. (1968) James Sinclair, 1913–1968; An obituary and an appreciation. *Gard. Bull. Singapore* 23: i–xxiii.
- Burkill, H.M. (1983) Murray Ross Henderson, 1899–1983, and some notes on the administration of botanical research in Malaysia. *J. Malaysian Branch Roy. Asiat. Soc.* 56: 87–104.
- Burkill, H.M. (1993) The Singapore Botanic Gardens: A reputation to cherish and preserve. In: *Proceedings of the Singapore Botanic Gardens 130th Anniversary Seminar*, pp. 10–15. Singapore: National Parks Board.
- Burkill, I.H. (1913) *Annual Report on the Botanic Gardens, Singapore and Penang for the year 1912*. Singapore: Government Printing Office, Straits Settlements.
- Burkill, I.H. (1918a) The establishment of the Botanic Gardens, Singapore. *Gard. Bull. Straits Settle.* 2: 55–63.
- Burkill, I.H. (1918b) The second phase in the history of the Botanic Gardens, Singapore. *Gard. Bull. Straits Settle.* 2: 93–108.
- Burkill, I.H. (1927) Botanical Collectors, Collections and Collecting Places in the Malay Peninsula. *Gard. Bull. Straits Settle.* 4: 113–202.
- Burkill, I.H. (1935) *A Dictionary of the Economic Products of the Malay Peninsula*. London: Straits Settlements & Federated Malay States. (Reprinted 1966, Kuala Lumpur: Ministry of Agriculture & Co-operatives, Malaysia; 3rd printing 1993, Kuala Lumpur: Ministry of Agriculture, Malaysia.)
- Burkill, I.H. (1951) Dioscoreaceae. In: Steenis, C.G.G.J. van (ed) *Flora Malesiana Series I*, 4(3): 293–335. Batavia: Noordhoff-Kolff N.V.
- Chan, L. & Corlett, R.T. (eds) (1997) *Biodiversity in the Nature Reserves of Singapore*. *Gard. Bull. Singapore* 49: 147–159.
- Chew, Wee-Lek (1963) Florae Malesianae Precursores—XXXIV. A revision of the genus *Poikilospermum* (Urticaceae). *Gard. Bull. Singapore* 20: 1–103.
- Chew, Wee-Lek (1965) *Laportea* and allied genera (Urticaceae). *Gard. Bull. Singapore* 21: 195–208.
- Chew, Wee-Lek (1969a) *Discocnide* (Urticaceae). *Gard. Bull. Singapore* 24: 355–359.
- Chew, Wee-Lek (1969b) *Nothocnide* (Urticaceae) in Malesia. *Gard. Bull. Singapore* 24: 361–373.
- Chin, S.C. (1977) The limestone hill flora of Malaya I. *Gard. Bull. Singapore* 30: 165–219.
- Chin, S.C. (1979) The limestone hill flora of Malaya II. *Gard. Bull. Singapore* 32: 64–203.
- Chin, S.C. (1983) The limestone hill flora of Malaya III. *Gard. Bull. Singapore* 35: 137–190.
- Chin, S.C. (1983) The limestone hill flora of Malaya IV. *Gard. Bull. Singapore* 36: 31–91.
- Chin, S.C., Corlett, R.T., Wee, Y.C. & Geh, S.Y. (eds) (1995). *Rain Forest in the City: Bukit Timah Nature Reserve, Singapore*. *Gard. Bull. Singapore, Supplement* no. 3.
- Corner, E.J.H. (1940) *Wayside Trees of Malaya*, 2 vols. Singapore: Government Printing Office. (2nd ed. 1952, Singapore: Government Printing Office; 3rd ed. 1988, Kuala Lumpur: Malayan Nature Society.)
- Corner, E.J.H. (1946) Japanese men of science in Malaya during the Japanese occupation. *Nature* 158: 63.
- Corner, E.J.H. (1962) The Classification of Moraceae. *Gard. Bull. Singapore* 19: 187–252.
- Corner, E.J.H. (1965) Mount Kinabalu East. *Sabah Soc. J.* 4: 170–187.

- Corner, E.J.H. (1978) *The Freshwater Swamp-Forest of South Johore and Singapore*. Gard. Bull. Singapore, Supplement no. 1.
- Corner, E.J.H. (1981) *The Marquis, a tale of Syonan-to*. Singapore: Heinemann Asia.
- Curtis, C. (1894) Catalogue of the Flowering Plants and Ferns found growing wild in the Island of Penang. *J. Straits Branch Roy. Asiat. Soc.* 25: 67–163.
- Duistermaat, H. (2005) *Field Guide to the Grasses of Singapore (Excluding the Bamboos)*. Gard. Bull. Singapore 57 (Supplement): 1–177.
- Fortey, R. (2005) *Earth. An Intimate History*. New York: Vintage Books.
- Furtado, C.X. & Holttum, R.E. (1960) I.H. Burkill in Malaya. Gard. Bull. Singapore 17: 350–356.
- Hill, H.C. (1900a) *The present system of forest administration in the Federated Malay States with suggestions for future management*. Kuala Lumpur: Government Printer.
- Hill, H.C. (1900b) *The present system of forest conservancy in the Straits Settlements with suggestions for future management*. Singapore: Government Printer.
- Holttum, R.E. (1950) The Zingiberaceae of the Malay Peninsula. Gard. Bull. Singapore 13: 1–250.
- Holttum, R.E. (1953) *A Revised Flora of Malaya, vol. I. Orchids of Malaya*. Singapore: Government Printing Office. (Reprinted 1960, 2nd ed. 1966.)
- Holttum, R.E. (1954) *A Revised Flora of Malaya, vol. II. Ferns of Malaya*. Singapore: Government Printing Office. (2nd ed. 1957, 3rd ed. 1964.)
- Holttum, R.E. (1958a) The bamboos of the Malay Peninsula. Gard. Bull. Singapore 16: 1–135.
- Holttum, R.E. (1958b) Kwan Koriba. Gard. Bull. Singapore 17: 339–340.
- Holttum, R.E. (1959) Orchids, gingers and bamboos: Pioneer work at the Singapore Botanic Gardens and its significance for botany and horticulture. Gard. Bull. Singapore 17: 190–194.
- Holttum, R.E. (1967) Isaac Henry Burkill 1870–1965. Gard. Bull. Singapore 22: 67–70.
- Johnson, D.V. & Tay, E.P. (1999) C.X. Furtado (1897–1980): Contributions to the study of palms. Gard. Bull. Singapore 51: 141–150.
- Karch, S.B. (1998) *A Brief History of Cocaine*. Boca Raton, Florida: CRC Press.
- Keng, H. (1969) Flora Malesianae Precursores XLVIII. A revision of Malesian Labiatae. Gard. Bull. Singapore 24: 13–180.
- Kiew, R. (1999) The Singapore Botanic Gardens Herbarium—125 years of history. Gard. Bull. Singapore 51: 151–161.
- Kiew, R. (2005) *Begonias of Peninsular Malaysia*. Kota Kinabalu: Natural History Publications (Borneo).
- LaFrankie, J.V., Davies, S.J., Wang, L.K., Lee, S.K. & Lum, S.K.Y. (2005) *Forest Trees of Bukit Timah. Population Ecology in a Tropical Forest Fragment*. Singapore: Simply Green.
- Lam, H.J. (1959) A tale of two cities: Singapore and Leiden. Gard. Bull. Singapore 17: 166–170.
- Mabberley, D.J. & Chang, Kiaw Lan (eds) (1977) Tropical Botany. Essays presented to E.J.H. Corner for his seventieth birthday, 1976. Gard. Bull. Singapore 29: 1–266.
- Mandalam, K.R. (2005) Edred John Henry Corner: Leader, First and Second Royal Society Expeditions to North Borneo. In: Mandalam, K.R., Davison, G.W.H. & Regis, P. (eds) *East Kinabalu, Royal Society Expeditions 40th Anniversary Monograph*, pp. 1–3. Kota Kinabalu: The Sabah Society.
- Mandalam, K.R. (2011) *The Kotal Route Sketches, Royal Society Kinabalu Expedition 1964. Original Field Sketches of Prof. John Corner*. Kota Kinabalu: The Sabah Society.
- Menon, K.D. (1969) A brief history of forest research in Malaya. *Malayan Forester* 32: 3–29.

- Ministry of National Development (1977) Annual Report 1976. Singapore: Ministry of National Development.
- Muller, L. (1998) Flowering and fruiting of a *Gigantochloa ridleyi* clone, seed germination and growth. *Amer. Bamboo Soc. Newslett.* 19(3): 8–11.
- Muller, L. (1999) The many reproductive modes of clumping bamboos. *Amer. Bamboo Soc. Newslett.* 20(5): 1–4.
- Munir Ahmad Abid (1965) A revision of *Petraeovitex* (Verbenaceae). *Gard. Bull. Singapore* 21: 215–257.
- Munir Ahmad Abid (1967) A revision of *Symphorema*. Verbenaceae. *Gard. Bull. Singapore* 22: 153–171.
- Ng, F.S.P. & Jacobs, M. (1983) A guide to King's "Materials for a Flora of The Malayan Peninsula". *Gard. Bull. Singapore* 36: 177–185.
- Purseglove, J.W. (1955a) Mr. H.N. Ridley's hundredth birthday. *Nature* 176: 1092–1093.
- Purseglove, J.W. (1955b) Ridley, Malaya's greatest naturalist. *Malayan Nat. J.* 10(2): 43–55.
- Purseglove, J.W. (1955c) *The Ridley Centenary*. Singapore: Government Printer.
- Purseglove, J.W. (1959) History and functions of Botanic Gardens with special reference to Singapore. *Gard. Bull. Singapore* 17: 125–154.
- Ridley, H.N. (1900) Flora of Singapore. *J. Straits Branch Roy. Asiat. Soc.* 33: 27–196.
- Ridley, H.N. (1907) *Materials for a Flora of the Malayan Peninsula. Part I*, pp. 1–233; *Part II*, pp. 1–235; *Part III*, pp. 1–197. Singapore: Methodist Publishing House.
- Ridley, H.N. (1908) *Annual Report on the Botanic Gardens, Singapore, for the Year 1907*. Singapore: Government Printing Office.
- Ridley, H.N. (1922–1925) *The Flora of the Malay Peninsula*, vols. 1–5. London: Reeve & Co.
- Sinclair, J. (1958) A revision of Malayan Myristicaceae. *Gard. Bull. Singapore* 16: 205–466.
- Sinclair, J. (1958) Florae Malesianae Precursores—XX. The genus *Gymnacranthera* (Myristicaceae) in Malaysia. *Gard. Bull. Singapore* 17: 96–120.
- Sinclair, J. (1961) Florae Malesianae Precursores—XXXI. The genus *Knema* (Myristicaceae) in Malaysia and outside Malaysia. *Gard. Bull. Singapore* 18: 102–327.
- Sinclair, J. (1968) Florae Malesianae Precursores—XLII, The genus *Myristica* (Myristicaceae) in Malesia and outside Malesia. *Gard. Bull. Singapore* 23: 1–540.
- Sinclair, J. (1974) The genus *Horsfieldia* (Myristicaceae) in and outside Malesia I: *H. sabulosa* and *H. whitmorei* J. Sinclair spp. nov. *Gard. Bull. Singapore* 27: 133–141.
- Sinclair, J. (1975) The genus *Horsfieldia* (Myristicaceae) in and outside Malesia II. *Gard. Bull. Singapore* 28: 1–181.
- Steenis, C.G.G.J. van (1948) *Flora Malesiana Series I*, 4(1). Batavia: Noordhoff-Kolff N.V.
- Steenis, C.G.G.J. van (1959) Singapore and Flora Malesiana. *Gard. Bull. Singapore* 17: 161–165.
- Swan, F.R. (1988) Tree distribution patterns in the Bukit Timah Nature Reserve. Singapore. *Gard. Bull. Singapore* 47: 59–81.
- Tan, H.T.W., Chua, K.S. & Turner, I.M. (1992a) The Angiosperm Flora of Singapore Project. *Gard. Bull. Singapore* 44: 1–2.
- Tan, H.T.W., Ali Ibrahim & Chua, K.S. (1992b) Additions to the Flora of Singapore, I. *Gard. Bull. Singapore* 44: 127–133.
- Turner, I.M. (1995) A Catalogue of the Vascular Plants of Malaya. *Gard. Bull. Singapore* 47: 1–757.
- Turner, I.M., Boo, C.M., Wong, Y.K., Chew, P.T. & Ali Ibrahim (1996) Freshwater swamp forest in Singapore, with particular reference to that found around the Nee Soon Firing Ranges. *Gard. Bull. Singapore* 48: 129–157.

- Vermeulen, J.J. (2000) Carr's spirit collection of Kinabalu orchids recovered, with some notes on *Bulbophyllum* species present in this collection. *Gard. Bull. Singapore* 52: 273–284.
- Watson, J.G. (1950) Some materials for a forest history of Malaya. *Malayan Forester* 13: 63–72.
- Wong, K.M. (1987) The herbarium and arboretum of the Forest Research Institute of Malaysia at Kepong—a historical perspective. *Gard. Bull. Singapore* 40: 15–30.
- Wong, K.M. (2003) Dr Chang Kiaw Lan. 31 July 1927–14 August 2003. *Gard. Bull. Singapore* 55: 309–315.
- Wong, K.M. (2004) *Bamboo, The Amazing Grass. A Guide to the Diversity and Study of Bamboos in Southeast Asia*. Kuala Lumpur: International Plant Genetic Resources Institute (IPGRI) & University of Malaya.
- Wong, Y.K. (1987) Ecology of the trees of Bukit Timah Nature Reserve. *Gard. Bull. Singapore* 40: 45–76.
- Wong, Y.K., Chew, P.T. & Ali Ibrahim (1994) The tree communities of the Central Catchment Nature Reserve, Singapore. *Gard. Bull. Singapore* 46: 37–63.
- Wyatt-Smith, J. (1950) Virgin Jungle Reserves. *Malayan Forester* 13: 92–94.
- Wycherley, P.R. (1959) The Singapore Botanic Gardens and Rubber in Malaya. *Gard. Bull. Singapore* 17: 175–186.